ABSTRACT OF THE INVENTION

A method of making a contact plug and a metallization line structure is disclosed in which a substrate is provided with at least one contact hole within an insulation layer situated on a semiconductor substrate of a semiconductor wafer. A first metal layer is deposited upon the semiconductor wafer within the contact hole. A planarizing step isolates the first metal layer within the insulation layer in the form of a contact plug within the contact hole. A second metal layer is then deposited upon the semiconductor wafer over and upon the contact plug. Metallization lines are patterned and etched from the second metal layer. The contact hole may also be lined with a refractory metal nitride layer, with a refractory metal silicide interface being formed at the bottom of the contact hole as an interface between the contact plug and a silicon layer on the semiconductor substrate. Article qualities are achieved by the inventive method, including reduced interfacial resistance and its consequent faster signal speed for the structure, reduced metal creep where additional selected alloys are allowed to diffuse a selected quantity of preferred alloying elements from the first metal layer to the second metal layer, improved depth-of-focus requirements for patterning metallization lines, and resistance of electromigration in aluminum metallization lines.

WORKMAN NYDEGGER
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
1000 EAGLE GATE TOWER
60 EAST SOUTH TEMPLE
SALT LAKE CITY, UTAH 84111

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